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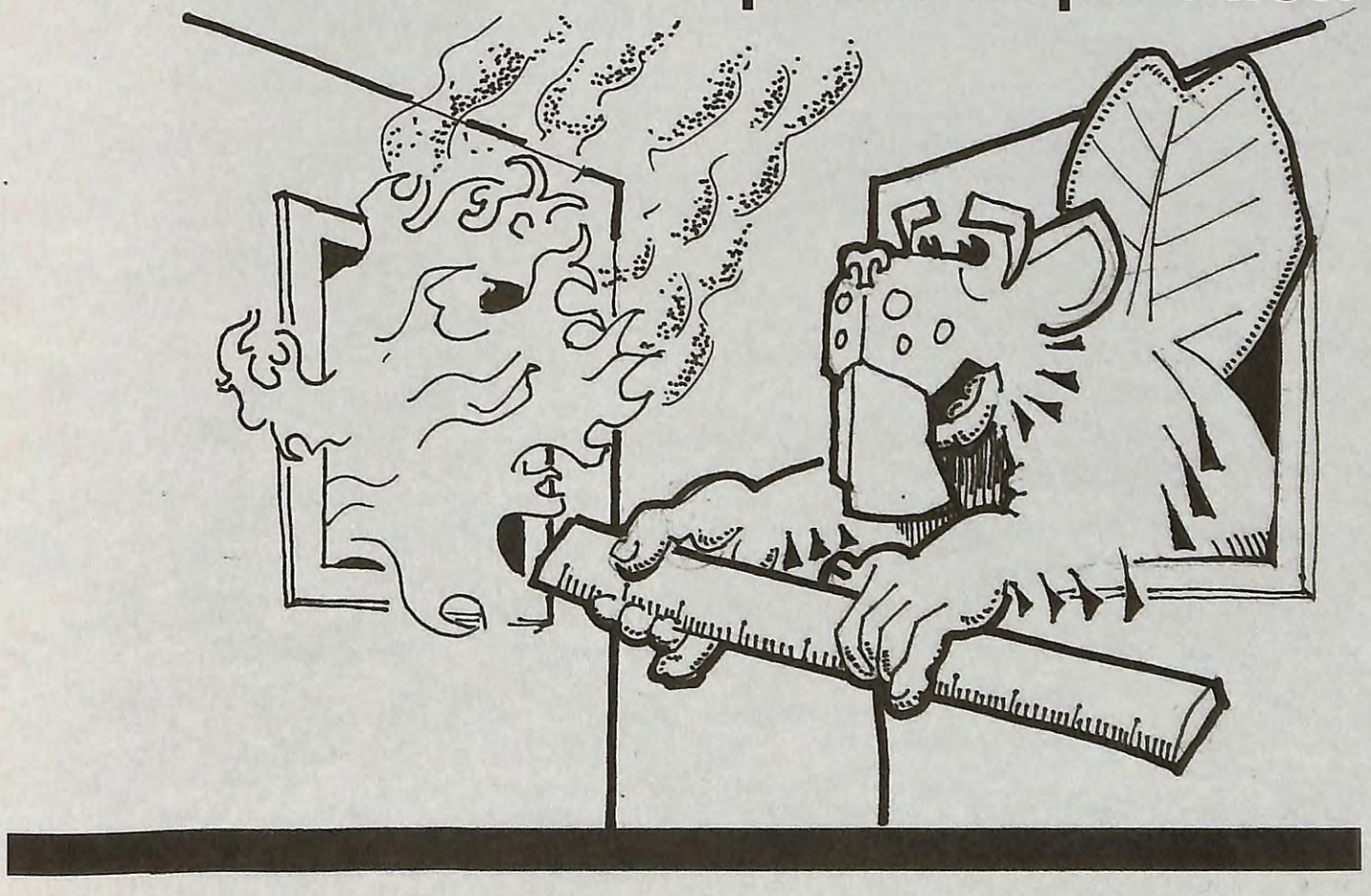
Spatial Separation



From the Editor . . .

My friend Joe Lstiburek, the Canadian building scientist who went on to change residential construction practices in the US, has been criss-crossing the States for years, showing builders, designers and anyone else who would listen, basic building science fundamentals, going on-site and identifying mistakes, and showing how improvements can be made. Joe's success is in his casual presentation style. Highlighting the silly mistakes that happen so often on a job site makes a powerful presentation. He also likes to preface the most silly mistakes by asking where was the adult supervision to keep everyone out of trouble.

His casual reference to adult supervision has come to mind recently as I've observed actions of some local building officials, especially when it comes to interpreting changes in the latest version of the National Building Code, which has been drafted with clearly stated objectives. The intent, when the code was drafted, was to clarify the intent behind code provisions and to make the code document more flexible allowing for new and alternative approaches to construction.

In BC, unlike most other Canadian jurisdictions, although the province drafts the Building Code (basically adopting the National Building Code of Canada with minor adjustments) and mandates its application across the province, it leaves virtually all the administration and final interpretive decisions up to the local building departments.

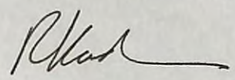
Some jurisdictions, especially smaller communities, don't have the technical capacity for evaluating alternative solutions, so they rely on professionals to take responsibility. Others, including the City of Surrey, which is one of the largest and most active jurisdictions in BC with a large technical staff, seem to have taken it unto themselves not to approve viable alternative solutions, especially in Part 9 buildings (houses and small buildings).

They may go through the motions, but at the end of the day invariably turn down any details that are not explicitly spelled out in Part B of the code. It doesn't matter how a proposal is framed or what documentation is provided. It seems that only documents produced by the Canadian Construction Materials Centre (CCMC), which show exactly that application, will be accepted. All other options are turned down. Even code appendix notes, which are meant to clarify the intent of the code and to explain something that can't be easily defined within the strict manner in which code language must be, seem to be inconsequential to the city.

One example is with the new code requirement for mandatory rain screens in the coastal environment which was written in because of all the problems on the west coast.

The code requires that a drainage cavity be created to enhance the drying potential of walls. The code says to create a cavity, not how to do it. A number of manufacturers have come up with innovative products that make it easier for a builder to create the drain screen cavity. These products are widely used in this region and across the continent, except in Surrey, which out of the blue has insisted that these products be certified, otherwise they will not be accepted (ignoring the fact there is no certification standard for what is, essentially, a spacer). Plan checkers are instructed to tell applicants that these products are not accepted by the city. They are even ignoring the code appendix note that suggests that a range of products other than wood strapping are on the market that will do the job. But I guess that Surrey doesn't read the appendix. What a pity.

There is a need for adult supervision from time to time. Perhaps this is one case where that is so.



Richard Kadulski,
Editor

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Tel: 604-689-1841 Fax: 604-689-1841
e-mail: solplan@shaw.ca
Street address:
#204 - 1037 West Broadway
Vancouver, BC V6H 1E3

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Fire Protection:
Spatial Separation Between Buildings

Fire is a fundamental element. It wasn't until mankind harnessed fire that human progress started. We have used it and relied on it for millennia. It keeps us warm on a cold day, it cooks food for sustenance, and it is an important way we harness energy to do our work. We burn coal and gas to generate electricity to run our computers and other equipment. Even today, the most efficient furnaces and water heaters rely on fire. At the same time, even with our sophisticated mechanical systems, fire fighting tools, materials and building designs, fire is a force that can overwhelm us. The recent bush fires in southern California, the forest fires in Greece, Australia, and other parts of the world, as well as the annual forest fires in Canada are simply a visible manifestation of nature's power that we have not completely mastered.

Fire safety is one of the fundamental objectives in the building code. Building codes set standards to minimize loss of life in the event of fire in our buildings. The construction assemblies and the resistance to fire that they present, are constantly being evaluated and tweaked as more knowledge is gained. Often, the knowledge is gained by observation of the damage caused by fires.

Recently a spate of fires in Alberta has caused building and fire officials there to investigate current standards and what can be done to improve fire safety. Information collected at fire incidents has been supplemented by testing of building assemblies at the fire testing laboratories at the National Research Council.

Code requirements for protection against fire spread have assumed that the size and configuration of the exposing faces are similar and that the buildings are placed equidistant from the property line. However, this is not always the case. Increases in housing density means that we are seeing more houses being placed closely together, rather than fewer. Today we are seeing more innovative zoning regulations, often using zero lot line setbacks. When buildings are of different sizes, the smaller building could be at greater risk than the larger building.

Research has shown that houses spaced less than 8 feet apart (2.4 m) are more susceptible to fire spread than those spaced further apart.

Fire Spread

Fire spreads by embers that are picked up by the wind and land on flammable materials, setting them on fire. This is one way that grass and forest fires spread and also one way a fire can spread from building to building. Fire can also spread by radiant transfer. The heat from an intense fire can transfer across space and heat materials that are in the line of sight – if the fire is intense enough, the radiant transfer can be enough to raise the temperature of the materials it "sees" to a point that the receiving surface temperature is raised above the ignition temperature for that material.

It is the radiant transfer of heat from one building, through a window, that can start a fire in an adjoining building. That is why building codes have set up criteria for maximum allowable openings in a wall that faces another building. The allowable openings are sized based on historical use, and recognize that the further apart buildings are, the less likely an intense heat source will cause problems, as the heat dissipates over distances.

In the past, windows on a sidewall were placed there for light and ventilation. They were generally small and distributed across the face of the wall. With smaller windows, there is less likelihood of a fire spreading as quickly as through a single large window. Today new buildings tend to be designed differently than in the past – the allowable openings tend to be focused in one or two large windows. That is what has been observed in recent fires in Calgary.

What is also surprising is how often new homes in developments have windows positioned directly opposite one another because plans typically are repeated or at most mirror images. One would think that since the houses are being built roughly at the same time by the same builder, there would be some coordination with window placement so one house doesn't look into their

neighbour's house. However, that rarely happens, so we see many windows that are directly opposite each other, rather than being at least offset by a few feet. That would have the effect not only of providing privacy, but also reducing fire risk spread through radiant transfer through the window.

Proposals have been made in Alberta to change code requirements and introduce limits on concentrations of openings where the limiting distance is small. They would require windows in sidewalls not be concentrated in a single larger opening, but be smaller units distributed across the façade.

Attic venting

Another way that fire can spread is through the attic. A fire moving up the wall can enter the attic space through the soffit vents, starting a fire in the roof structure. Where houses are close together, the fire can also leap across the gap between houses, and enter the roof space of the neighbouring house and set it on fire. The roof overhang can also act as a baffle to divert flames towards the neighbouring house. This has been observed in a number of recent fires in Alberta.

That is why proposals to code bodies in Alberta have also been made to provide protection to soffits for walls and projections when they are within 4 feet (1.2 meters) of a property line. The use of unvented eaves is seen as one of the most effective measures to slow fire spread into the attic and house.

Construction of Exposing Building Faces

The actual construction of walls exposed to potential fire must also be considered. For buildings with narrow separating distances, non-combustible construction materials and assemblies must be used. A grey area is the construction of walls as the separation increases.

The larger quantities of plastics used in buildings and in construction materials today result in higher temperatures and greater flame extension during a fire, so that the heat received by an adjoining building exposed to a fire is much higher.

The Alberta fires have placed more attention to just how fire resistant common assemblies are. The widespread use of vinyl siding, which is not a fire resistant material and has a low melting point requires a review of these details. One way to increase the fire resistance for vinyl siding walls is to use gypsum board sheathing under the vinyl siding.

Combustible projections as well as soffits on projections can provide a path that spreads the fire into the living space, so that they should be protected, especially if they are within 4 feet (1.2 meters) of a property line. This has been compounded by design changes in new homes where projecting bays are significantly larger than those initially considered when spatial searation criteria were drafted. That is why consideration is being given to treat the face of the projecting structure to be the defining face for calculation of limiting distances.☼

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Richard Kadulski Architect

#204 - 1037 West Broadway
Vancouver, B.C. V6H 1E3
Tel: (604) 689-1841
Fax: (604) 689-1841
e-mail: kadulski@direct.ca

Stormwater Management:
Old Concrete Technology Solution To A New Problem

Stormwater management is a major concern for municipal engineers. On an undeveloped site, a large proportion of surface water is taken care of by the soil which absorbs the water and some by run-off into water courses. With ever-increasing densities, more land is paved and covered with impervious surfaces so that during intense storm events, hard, impervious surfaces (including parking and roof areas) become conduits for water that quickly overload storm sewers.

Increasingly, municipal planners and engineers are calculating the amount of hard, non-porous areas in cities. In some jurisdictions, there are regulated limits on non-permeable surfaces even for single-family dwellings. It's not just a matter of the city wanting to be environmentally sensitive, but being very practical about ways to reduce the stormwater loads on the civic infrastructure.

Environmental regulations set limits on the levels of pollution that can reach streams and lakes. To deal with these regulations, two basic approaches can be taken: either reduce the overall run-off from an area, or reduce the level of pollution contained in runoff.

By capturing the first flush of rainfall and allowing it to percolate into the ground, soil chemistry and biology can "treat" the water naturally. By collecting rainfall and allowing it to infiltrate into the ground, groundwater aquifer recharge is also increased, peak water flow through drainage channels is reduced, and flooding is minimized.

In urban areas, we cannot avoid hard surfaces. However, stormwater runoff can be reduced by the use of porous paving materials that allow water to percolate into the soil. The ready-mixed concrete industry has begun to aggressively promote a product called pervious concrete. Pervious concrete pavement reduces or eliminates runoff and allows the soil to naturally treat some pollutants. When it is used as a pavement in conjunction with an underlying stone reservoir, it can capture and store rainwater allowing it to infiltrate into the subsoil.

Pervious concrete has been referred to as "no fines", "porous concrete", or "gap graded". Similar products have been used in North America over the last fifty years in varying applications but generally not as a finished product. Pervious concrete is defined as a zero slump, open-graded material consisting of cement, coarse aggregate, no or little fines, admixtures and water. This is the definition used in the ACI document 522R-06 "Pervious Concrete".

Water and cement materials are used to create a paste that forms a thick coating around aggregate particles. The pervious concrete mixture contains little or no sand, creating a substantial void content. Using enough paste to coat and bind the aggregate particles together creates a system of highly permeable, interconnected voids that drain quickly. The properties of the concrete may vary but the mix targets 15% to 25% air voids in the hardened concrete. It is these voids that help manage the stormwater management that is in high demand from environmental services of Canadian municipalities. Flow rates for water through pervious concrete are typically around 480 in/hr (0.34 cm/s, which is 5 gal/ft²/min or 200 L/m²/min). This helps divert runoff water from the storm sewers, thereby minimizing the impact on municipal water treatment requirements and, by allowing stormwater to infiltrate at source, you reintroduce the natural form of water treatment in the soil. The drainability varies but ranges from 80 to 750 L/min/m² that will handle most storm situations. Typically, if a soil type has sufficient percolation to support a septic tank system, it will be suitable for pervious concrete.

The density of pervious concrete depends on the properties and proportions of the materials used, and on the compaction procedures used when it is placed. In-place densities on the order of 100 lb/ft³ to 125 lb/ft³ (1600 kg/m³ to 2000 kg/m³) are common, which is in the upper range of lightweight concretes. A pavement 5 inches (125 mm) thick with 20% voids will be able to store 1 inch (25 mm) of a sustained rainstorm

in its voids, which covers most rainfall events in Canada. When placed on a 6-inch (150-mm) thick layer of open-graded gravel or crushed rock sub-base, the storage capacity increases to as much as 3 inches (75 mm) of precipitation.

The low mortar content and high porosity reduce the strength compared to conventional concrete mixtures. Depending on the mix design and application, compressive strengths of 3.5 to 27.5 MPa (500 psi to 4000 psi) are typical, sufficient for many applications. Applications include, but are not limited to, parking lots, walkways, landscaping and low volume roads. Use of colours or strips of the pervious pavement in combination with regular concrete provides design options to highlight a landscaped area.

Pervious concrete pavement is ideal for protecting trees in a paved environment. Pervious concrete placed in parking spaces and pavements adjacent to tree islands greatly increases the amount of rain available to the trees without reducing usable area.

Design of the overall system for stormwater retention or management will dictate what needs to be underneath the pervious concrete. If you are designing for a wet or dry retention pond, or for watering of landscaping, the geotechnical engineer will have to understand the parameters.

Due to the nature and final performance of the product, the way the concrete is placed and cured will be critical to the success of the pavement. Although pervious concrete can be mixed by the same suppliers and delivered by the same trucks as conventional dense concrete, its unique physical characteristics require a contractor with specialized experience. The placement and curing of concrete are all done on-site rather than in a factory under uniform conditions. The quality and performance of pervious concrete are dependent on the installer's familiarity with its properties. This can be gained only through hands-on experience with the substance, which is not a commonly used building material everywhere.

The concrete mix is relatively stiff so that a pump cannot be used for placement, but a conveyor or bucket or direct placement may be used. The use of a vibrating screed is important for optimum density and strength. After screeding, the material is usually compacted with a steel pipe roller. No trowelling to the finish is done, as too much overworking will seal the surface. Curing must follow immediately using plastic sheets. Failure to cure this product will cause the surface to dry, and the bond between the aggregate and the paste will not be strong enough to maintain a durable surface. The low water-cement ratio of this product makes curing a must as the mix design will be using up all the available water. This makes it important to also wet the base or sub-grade prior to its placement. After placement, pervious concrete has a textured surface which has been compared to popcorn or a Rice Krispies square.

In Ontario, the Ready Mix Concrete Association of Ontario will be requiring that contractors be certified to the National Ready Mixed Concrete Association's Pervious Contractor Certification course in order to assure some level of quality in the placement of the pervious concrete.

With all the voids and water that could be in the voids, a question that comes up immediately is how will this perform in freezing weather. We know that ice can create much damage as the frozen water expands and ice crystals grow.

Pervious pavement has had a good history of performance in northern US cities. Successful applications of pervious concrete in freeze-thaw environments have two common design features – the cement paste is air-entrained, and the pervious concrete is placed on 6–12 inches of drainable aggregate base (¾" or larger clean gravel).

Sand and salt can possibly impair the drainability of the surface. However, field history has shown that the drainability has not been impaired substantially over time, and vacuuming the surface on an annual basis restores the permeability of the product. Snowplowing may damage the surface depending on how tight the void structure is, but experience shows that less snow is retained on the top surface due to the permeability and, in the spring thaw, melting snow. As for freeze-thaw issues, the voids are too large to induce sufficient pressure to break the concrete. Based on the design of the system enough water will drain away quickly, minimizing the conditions for freezing.

In spite of all the anecdotal evidence to support its performance in cold weather, the Cement Association of Canada has entered into an agreement with the University of Waterloo to look at some of the technical issues surrounding permeable concrete.☼

Information: www.perviouspavement.org

Toilet Drain Performance

Toilets are the largest water-consuming appliances in a home. That is why the move is toward water efficient toilets. In some parts of Ontario and BC local regulations require 6-litre toilets to be installed in new construction. However, no Canadian province currently prohibits the sale and installation of 13 and 20 litre toilets, although many regions are beginning to require low flush toilets in new home construction.

Canada is behind most developed countries of the world, including the US, when it comes to reducing toilet water consumption. This hesitancy appears to stem from the perception that efficient low flush toilets do not perform well, and the perception that efficient toilets do not provide enough water to adequately transport waste to the sewer.

Some perceptions about low flush toilet performance may be based on early low flush toilet installations in retrofit applications. Early low flush toilets may not have been properly engineered to move adequate quantities of waste. In retrofit applications, the drain lines may have had inadequate slopes in the drain line, either because of poor installations or settlement over the years that resulted in reductions to the slope in the drain line.

The concern about toilet performance has been addressed through the CMHC-supported Maximum Performance (MaP) Testing of Toilets program. To date the MaP program has rated the flushing performance of more than 300 toilet models and identified more than 200 models that are certain to exceed customer expectations for performance. Updated MaP reports are posted on the Canada Water and Wastewater Association website. (*cwwa.ca/home_e.asp*)

The concern regarding the ability of water-efficient toilets to move waste into the sewer has been addressed with a second study. The study physically measured the effectiveness of nine different types of water-efficient toilets to move waste through both 75 mm and 100 mm pipes installed at different slopes

Variables tested included:

* Flush volume
* Slope of drain piping (2 %, 1 %, 0 %)
* Diameter of piping (75 mm and 100 mm),
* Mass of waste flushed

In a typical residential installation, drainlines carry wastewater not only from toilets but also from sinks, showers, clothes washers, and dishwashers. To establish a relative ranking of how well the different flushing systems were able to transport waste, the carry distance of each flushing system was compared to the average carry distance of all models tested. Researchers developed a test media that included measured quantities of bean paste and toilet paper to simulate typical human waste seen in a toilet.

Test results indicated that there does not appear to be any correlation between a toilet's ability to clear waste from the bowl and its ability to transport waste through the drainline.

However, it was noted that there is a positive correlation between the slope and of the drain and its ability to move waste. Steeper slopes carry waste further in the drain. For example, six litres of water could flush 200 g of waste through a 75 mm drainline an average of 6 m when the pipe was installed at a 0 % slope, 10 m when the pipe was installed with a 1 % slope, and 22 m when the pipe was installed at a 2 % slope. In larger diameter pipes the flow of water and waste is can spread out further, thus reducing the velocity of the flow and, consequently, reducing the carry distance. There did not appear to be a noticeable correlation between venting and drainline carry ability.

It has been estimated that only 20 to 30 % of residential toilet flushes contain solids other than toilet paper. As expected, a second 'liquid only' flush pushed the waste further along the drain. In real-world conditions the timing of a second flush would be somewhat variable, i.e., it may occur soon after an initial solids flushing or not for a day or more.

Carry distance was reduced when 'dips and sags' were introduced in the drainline. It was intended to verify that installing drainage piping that is not straight and true can lead to reductions in carry distances.

Most concerns expressed by the public involve the ability of low flush toilets to carry solid waste to the sewer in residential installations. These concerns may be somewhat misplaced as a toilet flush would only typically be expected to

***Evaluation of Water-Efficient Toilet Technologies to Carry Waste in Drainlines**, by Veritec Consulting Inc., for CMHC Research Division*

transport waste a short distance through building drains until the flow is augmented with various supplemental flows from sinks, showers, baths, clothes washers, etc. Rarely would a toilet flush alone be expected to transport waste to the municipal sewer or septic tank.

Testing showed that low flush toilets were able to transport test media approximately 20 m in a 75 mm drainline installed at a 2 % slope without any supplemental flows. Only in rare cases would residential requirements exceed this distance.☼

Built Green™ Platinum Launch

The Built Green™ program has announced revisions to the Built Green™ Technical Standard. This includes a new fourth Platinum level.

The Platinum level requires an EnerGuide rating of 82 plus 120 checklist points. This makes Built Green™ one of the most demanding environmental residential building programs in Canada. One of the significant changes for the Platinum level includes a mandatory requirement for a heat-recovery ventilator installed according to CSA F326 Residential Mechanical Ventilation Standard.

The Built Green™ checklist is made up of eight categories and builders must have a minimum number of points within each category. The categories are:

* Operational Systems
* Building Materials
* Exterior & Interior Finishes
* Indoor Air Quality
* Ventilation
* Waste Management
* Water Conservation
* Business Practices

The checklist makes up the backbone of the Built Green™ program. It is updated annually and it ensures that every Built Green™ project goes beyond energy efficiency. Each category of the checklist has a minimum point value that ensures that each category is represented in the final project.

Built Green™ is delivered through the Home Builders' Association in Alberta and British Columbia. The program was launched in Calgary in October 2003. The first projects were registered in March 2004 and since then 6,171 homes have been enrolled. This is the highest number of homes enrolled for any green home program in Canada.

The Platinum level became inevitable when it was realized in 2006 that more than 60% of Built Green™ projects were being built to the Gold level or higher. In 2007, an EnerGuide rating of 80 was the average for homes enrolled in the Built Green™ program.

Information: *www.builtgreencanada.ca*

Greening the BC Building Code: BC Building Code Changes

The BC Building and Safety Policy Branch is seeking public input on proposals for changes to the BC Building Code. These changes are part of the BC Government's climate change initiative, which included a commitment to green the BC Building Code.

The proposals come on the heels of changes to energy efficiency regulations, which come into force at the beginning of 2008. These have mandated higher efficiency gas furnaces, tested gas fireplaces, and higher performance windows.

The proposed code regulations, with a targeted implementation date of April 2008, will require homes to meet an Energuide for Houses rating of 77 or better, or an equivalent energy efficiency upgrade deemed to meet the standard. Comments on the proposals are being accepted until December 21, 2007.

For information, *http://www.housing.gov.bc.ca* and click on the "Greening the BC Building Code" button.

Technical Research Committee News

Canadian Home Builders' Association

Soil Gas Testing

Changes to radon guidelines are beginning to raise concerns about how builders need to handle this issue. For new-home builders, the challenge is to know how to determine if soil gas is a problem. Radon is very site- and building-specific and can only be identified after a building has been occupied and tested. This is after the role of the builder has been finished. Thus insisting on a radon test prior to completion of the house is not appropriate, nor can a test be obtained at any time, since the most meaningful tests are done over a period of several weeks during the heating season when the basement is subject to maximum pressure differentials.

Regions where the geology is known to have soils with radon are known, but that itself will not provide an answer. All that builders can do is build foundations airtight and allow for the potential remediation after the fact should radon be measured to be present. Airtight detailing of foundations will have the beneficial impact of reducing soil gas penetration into the house and, with a porous layer under the house, help reduce potential moisture problems in the basement.

Range Hoods And Make-Up Air

Some builders in Saskatchewan have encountered issues with local building inspectors who are insisting on a make-up air fan interlocked with a kitchen range that has a 150 cfm capacity since they have a concern about radon infiltration. There are two issues that need to be dealt with simultaneously.

The requirement for interlock of a make-up air fan is a problem, since most manufacturers have indicated that their warranty will be void if control wiring is altered to hook up another device. This is a challenge that code and regulatory authorities have had for some time. No matter what presentations have been made, the manufacturers deny there is any issue they need to deal with and simply ignore these concerns. Perhaps a successful major class action lawsuit will be needed to get their attention.

The second issue is with the building inspector – insisting on a make up air fan just because there is a range hood may not be solving anything, especially if the house does not achieve depressurization limits that are of concern. A requirement for a depressurization test if there is a concern would be more appropriate. If there are spillage-susceptible combustion appliances, or if soil gases are known to be a concern, then any fans capable of creating a depressurization if 5 Pascals or more would merit calling for a make-up air fan.

Design for Disassembly and Adaptability

We spend a lot of time and resources to improve the construction details to achieve more durable buildings. This is important as a sustainable strategy, as most buildings, houses and commercial buildings can be in use for a very long time. At the same time, as cities evolve and lifestyles change, we need to change the buildings we use to suit the altered lifestyles. If the building cannot be adapted, it will be torn down. We see far too many sound buildings coming down well before their natural lifespan is over because of changes in use, or changes in the community that make the building inappropriate for the location.

Recognizing that buildings may need to be disassembled and adapted, CSA has prepared the first edition of a new document: *CSA Z782-06 Guideline For Design For Disassembly And Adaptability In Buildings.* Design for disassembly and adaptability reduces the environmental footprint of the building industry by reducing

Front-Loading Washing Machine Vibration

Some time ago complaints were raised that some front-loading washing machines could be unbalanced and cause excessive vibration when installed on wood floors. Because of the high-speed spin cycles and the variability of the balance of the load, a harmonic resonance can be set off in wood-framed floors. Front-loading washing machines were developed in Europe, where most structures are concrete, so manufacturers were not aware there could be an issue.

The Technical Research Committee (TRC) is the industry's forum for the exchange of information on research and development in the housing sector.
Canadian Home Builders' Association, Suite 500, 150 Laurier Ave. West, Ottawa, Ont. K1P 5J4
Tel: (613) 230-3060
Fax: (613) 232-8214
e-mail: chba@chba.ca
www.chba.ca

A manufacturer in the US has developed a specialized multi-layered rigid plastic vibration-dampening pad that is placed under the feet of the washing machine. The pads sell for $30 a set. Reports are that the pad is very effective assuming a normally rigid floor structure. They go by the name of ***Ke Shake Away Plus Pads.*** These pads may also be useful to reduce vibration and noise from other mechanical equipment.

Information: *www.keshakeaway.com*

Counterfeit products

With the recent increase in value of the Canadian dollar, everyone is looking for price breaks on their purchases, however, it is important remain vigilant about counterfeit products. Although builders and trades installers are held responsible for their work, retailers do not face the same issue. Retailers can generally sell anything anyone is willing to purchase. They are not obliged to stand by the quality of the merchandise, as they are only middlemen. Nor are they required to restrict themselves to certified products, so that they can sell non-code compliant products.

The concern about properly certified products is not just an issue of maintaining brand value and supporting local manufacturers or suppliers, but one that has safety implications also. A number of stories were raised at the recent TRC meeting highlighting how the use of substandard products can be a health and safety issue in addition to being an expensive remediation issue. Examples provided included the case of a new high rise building in Vancouver that needs a complete plumbing retrofit because of faulty copper piping that had counterfeit labels. Another example was about tools originating overseas that are unsafe to use.

Builders who encounter unrealistically good deals or suspect products or materials, especially if they seem to have appropriate marks, should let the CHBA Manufacturers' Council know about them, because they could be fakes and merit action. The TRC will forward messages.☼

Measuring Energy Performance Improvements

A house is made up of components that work together to form an integrated system. We refer to this as the *House-as-a-System*. It is a way of saying that the performance of any one component in a house depends on its relationship with other components in the same house. A home's ventilation and heating components, construction materials, their assembly and the behaviour of occupants are all interrelated – a change to one affects all others.

Changing one component of a house without considering how it influences other components and the entire house system can waste energy and money. That is why it is important to consider the whole house when it is being designed.

In the dark ages, before the personal computer, and in an era of low energy prices and little awareness of environmental issues, homes were designed by trial and error and rules of thumb. Engineers, who understood energy flows, might do calculations, but they were time-consuming and cumbersome and usually the exception.

R-2000 is an initiative developed in the early 1980s by NRCan and the homebuilding industry with the aim of promoting the use of cost-effective energy-efficient building practices and technologies. It was a response to the energy crisis of the late 1970s, which started the first wave of energy conservation activity. The R-2000 standard is based on an energy consumption target for each house that is climate sensitive and includes a series of technical requirements for ventilation, airtightness, insulation, choice of materials, water use and other factors. The requirements are rigorous and result in new houses that use at least 30 % less energy than conventional new houses meeting current code standards.

The R-2000 standard is flexible enough to apply to any type of home. Since being introduced over 20 years ago, the R-2000 standard has set the benchmark for home building in Canada and overseas. The standard is upgraded periodically to include new technologies as they become established in the marketplace.

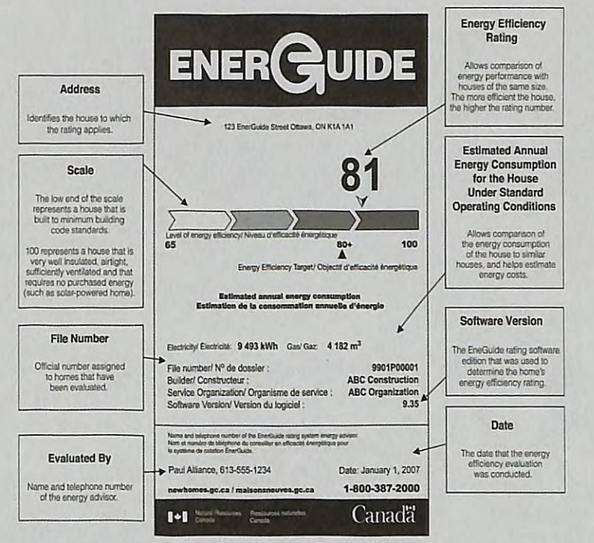
The support tools developed for R-2000 – builder training workshops, energy analysis protocols and HOT-2000 software – have provided guidance to the industry and regulators showing the direction for cost-effective performance improvements. Regulatory and housing agencies have taken advantage of these tools over the years to help identify cost-effective improvements and upgrade standards.

As a result of R-2000, manufacturers have developed many unique building products, such as heat recovery ventilators (now a $50-million-per-year industry in Canada), high-performance windows and integrated mechanical heating and cooling systems.

While other builder training programs have contributed to the improved quality of new housing, ongoing research ensures that the R-2000 standard remains at the leading edge of cost-effective energy-efficient construction technology. It has been identified as a world leader in energy-efficient housing technology. R-2000 has generated a lot of interest beyond Canada's borders. Today it's the basis of Canadian housing export programs in Japan, the UK, Ireland and China, helping Canadian exporters deliver high quality energy-efficient homes to markets seeking to improve energy performance.

While R-2000 has a very rigorous pass/fail standard that includes energy efficiency, all houses can be energy performance-rated with the EnerGuide Rating System (ERS). ERS takes advantage of the tools developed for R-2000 and offers a system that can measure both new and old houses.

ERS also takes into account the house-as-a-system concept. EnerGuide allows builders to design their own cost-effective energy performance enhancements, taking into account building envelope construction, window types, mechanical and ventilation systems, airtightness, solar heat gains and house orientation. House specs can be fine-tuned to optimize the best combination of upgrades. The protocols allow a builder to determine the performance level the house will achieve before setting foot on the job site. It also allows builders to offer prepackaged energy enhancements.


ENERGUIDE
Address
Identifies the house to which the rating applies.
123 EnerGuide Street Ottawa, ON K1A 1A1
Scale
The low end of the scale represents a house that is built to minimum building code standards.
100 represents a house that is very well insulated, airtight, sufficiently ventilated and that requires no purchased energy (such as solar-powered home).
81
Level of energy efficiency/ Niveau d'efficacité énergétique
65
80+
100
Energy Efficiency Target/ Objectif d'efficacité énergétique
Estimated annual energy consumption
Estimation de la consommation annuelle d'énergie
Electricity/ Électricité: 9 493 kWh Gas/ Gaz: 4 182 m³
File Number
Official number assigned to homes that have been evaluated.
File number/ N° de dossier : 9901P00001
Builder/ Constructeur : ABC Construction
Service Organization/ Organisme de service : ABC Organization
Software Version/ Version du logiciel : 9.35
Evaluated By
Name and telephone number of the energy advisor.
Paul Alliance, 613-555-1234
Date: January 1, 2007
newhomes.gc.ca / maisonsneuves.gc.ca
1-800-387-2000
Canada
Energy Efficiency Rating
Allows comparison of energy performance with houses of the same size. The more efficient the house, the higher the rating number.
Estimated Annual Energy Consumption for the House Under Standard Operating Conditions
Allows comparison of the energy consumption of the house to similar houses, and helps estimate energy costs.
Software Version
The EnerGuide rating software edition that was used to determine the home's energy efficiency rating.
Date
The date that the energy efficiency evaluation was conducted.

Approximately 300,000 EnerGuide evaluations have been done over the past years for existing houses and a growing number of new houses have been rated. This provides a large database showing the level of accuracy available.

Housing agencies and utilities have found the ERS a useful tool for measuring performance and setting standards for their initiatives. Recently, a number of provinces have moved to implement more stringent energy efficiency measures for new construction. Rather than re-invent something from scratch, they have been relying on the EnerGuide rating as a benchmark so that new construction must meet a designated rating. For the builder, the reference to an EnerGuide rating offers a flexible, inexpensive way for a builder to choose options for meeting more energy efficient standards.

Where EnerGuide is being referenced in the code, there will still be some prescriptive requirements that are deemed to be equivalent to the EnerGuide rating for those who do not wish to pursue the formal EnerGuide option.

Regional energy efficiency and green building initiatives are also relying on ERS for the energy calculation.

The Built Green™ program in Alberta and British Columbia has 4 levels, based on levels of energy efficiency, starting with a Bronze home with an EnerGuide rating of at least 72, a Silver home with a rating of 75, a Gold home a 77, and Platinum 82 or higher.

Manitoba Hydro and BC Hydro have a Power Smart New Home program focusing on energy efficiency.

Novoclimat homes in Quebec meet an EnerGuide rating of 78 or better.

The ENERGY STAR for New Homes initiative currently available in Ontario and Saskatchewan promotes energy efficiency guidelines for new homes that are approximately 30 percent more energy efficient than those built to minimum provincial building codes. At this level, the energy performance is similar to that of R-2000. ☼

Letters to the Editor

Re: How Much Insulation on a Storage Tank for Hot Water? (Energy Answers, Solplan Review No. 136, Sept 2007)

I read Rob Dumont's excellent article on whether or not to put insulation on a hot water tank with interest, as I had considered the problem myself and came to a different conclusion. The issues raised are also germane to the new low-energy light bulb program being thrust upon us by the federal government. Though most of the salient factors needed to think about the solution to the question were present in the article, and notwithstanding the wisdom of Aristotle to "not seek exactness when only an approximation of the truth is possible", I disagree that there can be a single country-wide "general rule" as was given.

I am an architect practicing on the west coast of B.C. in a temperate marine climate. As a general rule, single-family homes are not air conditioned here. In fact, although our degree-day numbers are low, and the total energy we expend is less than that in the colder, central parts of the country, our heating systems are active (albeit for short amounts of time daily) even in the spring and fall shoulder seasons. In this case, the hot water tank losses are almost entirely offset by energy savings in the home heating system.

Perhaps this is not true throughout each day, as the thermostat is often reduced during the sleeping hours, but on the other hand the hot water tank is often situated on the lowest floor on an uninsulated slab or in a cool basement where extra heat is often preferentially desired or required. If only 25% of Rob's annual standby heat loss of 876-kilowatt hours is the actual loss we are considering here, then that is worth about $15 per year at our west coast power costs. Labour cost to install insulation, and cradle-to-cradle energy and environmental costs for the insulation compared with similar "total" costs for the ongoing energy loss itself, may well make the equation a "wash". I refer to Aristotle for those who would make an even closer calculation.

If it were only insulation on hot water tanks we need to consider it would be of minor consequence, however, the essence of the above calculation (for the west coast) is also a consideration when selecting energy saving appliances or lighting fixtures. Here a more complete "Total Life Cycle Assessment" which includes embodied energy in the device itself, its life-span, and its disposal recycling requirements, in addition to the products' actual energy use (in the environment it is to be used) should be considered. For example, I have heard an (admittedly unverified but plausible) report that that the design of compressors on low energy refrigerators has compromised their longevity. If the margin of energy saving in dollars for a high efficiency fridge is very small, then for those living in a west coast, no air conditioning environment, the life cycle factor of how long the fridge will last becomes far more important.

I am in favour of the new push for low energy light sources, as in many locations use of these will truly lower our carbon imprint as well as provide new and valuable fixtures. It seems however, that the policy maker's rationale for the ban on incandescents ignores the ugly and unhealthy monochromatic light these new light sources produce, the nasty heavy metal recycling problem for some light types and absolutely

provides no consideration for the regional energy saving calculation as above. Call me skeptical, but I'm afraid that a large number of west coast homeowners will simply toss the polluting bulbs (as we do now with a large proportion of our batteries) into the trash when they are done, and never notice that their total energy bill has not changed at all.

But I digress, and returning to insulation on water tanks, the article's first assumption stated: "1. Heat loss from a storage tank is undesirable for a good part of the year", which is fine for most of the country, but perhaps not for the west coast. My point here being that even for simple energy cost consideration, we cannot simply compare a 100 watt bulb with a 23 watt florescent without considering carefully the environment in which it will be used.

Kent Green
Victoria BC

Interesting points you raise. Your comments may have merit for the many existing, older, less well-insulated homes we see on the west coast. However, I would suggest that we should also be considering new home construction standards. On the west coast, with the milder climate, it should be possible to build homes that have virtually no space heating loads, at which time any uncontrolled heat sources inside the house could be a source of concern for overheating.

As to your comments about light quality from compact fluorescent lamps (CFL), much is subjective. This past year I have been on the road much more that I would care, and have seen the inside of too many hotels, both in Canada and overseas. One thing that caught my attention was how much the light rendition of new CFLs has improved. It took me a while to realize that an old fashioned incandescent lamp is now the rare exception even in the most upscale hotel. The CFLs are being used in the decorative and utilitarian applications, including bathroom vanity lighting, where proper colour rendition is so important.

As for the use of heavy metals in CFLs today it is miniscule compared with fluorescent lamps made even a few years ago. This is one area where considerable progress has been made so the waste management and contamination is not the same concern as it once was. I think it would be interesting to do a total life cycle analysis comparing the costs of manufacture and transport and waste disposal of conventional incandescent lamps with CFLs. The long life of a CFL needs to be compared with the number of incandescent lamps that would be required for the same time.

If the average incandescent lamp has a lifespan of 1000 hours, one would use ten such lamps during the life of a single CFL, which has a lifespan of about 10,000 hours. Ed.

Re: Energy Standards for Houses (Solplan Review No. 137, Sept 2007)

It is always a pleasure to read Solplan Review.

I read with interest your article on Energy Standards for Houses. Good job. It's interesting that people like you and I look at this from the builder's viewpoint and the benefits as well as consumer benefits, while CHBA, which has raised major objections, brings politics into it and takes a negative viewpoint.

We all should be pulling on the same set of oars with the following goals at the forefront:

* improvement to the energy performance of the house
* positive impact on the environment
* cost-effectiveness as it relates to operating costs of the house
* allowing the builder to be creative

EnerGuide 80 meets these goals and more. Let's move forward and remove politics when making improvement to our houses that are in the best interest of the homeowner.

Jack Parsons
Flatrock, NL

You Asked Us About: Airtightness, Ventilation & EGNH

What is the appropriate airtightness level for a new house? If we are going to see new houses mandated to meet an Energuide rating of 80 or its equivalent, what is the appropriate airtightness level to maintain indoor air quality, yet maximize energy efficiency? Would the same tightness be required whether or not a heat recovery ventilator is installed?

It is important to recognize that the EGNH rating does not have any explicit airtightness target. It merely rates the energy performance of a house under assumed operating conditions in a specific location and all the interrelated elements – building envelope construction, mechanical systems and airtightness – are considered together.

The building code requires the use of airtight materials for the construction of an air barrier (and the airtightness criteria for materials are defined), but the code is silent about the SYSTEM as a whole. While it would be interesting to define a reasonable airtightness criteria for a whole house, it would present a problem for the industry to have a number specified in the code because some authorities would see that as a justification to insist on every single house being airtightness tested, imposing an added cost for each house and taxing the present infrastructure. And it is doubtful if, at the end of the day, it would be meaningful.

However, a note in the appendix to the code, which strictly is not enforceable, might provide guidance to all concerned.

Whether the house is airtight or not will not really tell you what the indoor quality will be like, or whether you will have adequate air change. One of the big misconceptions is that a house that is not airtight will have acceptable indoor air quality. In fact, unless there is an effective and functioning mechanical ventilation system to move air, for a large portion of the year there will not be much air change. "Natural" air leakage provides maximum air change only during the coldest days of the year. During the shoulder season (fall, spring) and summer, there will be little or no "natural" air change simply because there is no driving force to move the air.

CMHC surveyed a community in Ontario several years ago, investigating the indoor air quality in more than 400 hundred houses. These included newly built homes with code-compliant mechanical ventilation systems as well as century-old houses, and every age in between. The most significant finding was that neither age nor airtightness was an indication of indoor air quality within the house. Some of the oldest, leakiest houses had some of the worst indoor air quality.

The problem is that you can measure how leaky the house is overall, but that will not tell you where the leaks are, nor how effectively the fresh air will be distributed through the house. If all the leakage is at the lowest level and the bedrooms are on the upper floor, there is no certainty that any fresh air will do much good in the house.

Some of the confusion arises through the terminology we use for testing the airtightness of a house. Airtightness is called up as Air Changes per Hour (ACH) at 50 Pa pressure difference. However, this is not the same as the air change under normal conditions. A very rough translation is to divide the ACH@50Pa number by 20 to get an approximation of natural air change.

Old, very drafty houses could have ACH@50 numbers in the range of 10 and up. This means one might get 0.5 air change through "natural ventilation". This is much more ventilation than is needed to remove normal levels of pollutants and maintain healthy air, provided that there is a driving force to move the air. There is no certainty where the fresh air enters the house. The incidental air leakage paths sometimes also provide very bad air by drawing air into the house through moldy walls or polluted garages or wet basements. In older leaky houses, this might have been masked by the massive quantities of air change.

The problem is that in calm weather conditions or in sheltered locations (i.e. houses spaced together in a subdivision or surrounded by a forest) there is little wind pressure available to drive air change so that the accidental ("natural") ventilation drops significantly. If the temperature difference between outside and inside is small, then buoyancy pressures don't drive much ventilation either. In addition, during cool weather people tend to keep their house closed so there will be even less potential for air change. In a very loose house (which means it is also uncomfortable, non-durable, often unhealthy as well as an energy pig) this won't harm the occupants.

Experience and studies suggest that for the average house, ventilation in the range of 0.2 to 0.35 ACH is required for moisture control in cold weather and fresh air year-round. This assumes that air is not delivered to each room and relies on some distribution between the bedroom (with a closed door) and the living room or the kitchen.

Today we build more energy efficient and airtight houses. Many houses today are tight, with an air change often in the range of 2 to 3 ACH@50 Pa. R-2000 homes are less than 1.5 ACH. These numbers result in accidental air change of much less than 0.2 ACH@50 and lead to problems with indoor air quality and moisture problems. That is why mechanical ventilation is needed to maintain good indoor air quality. Although mechanical ventilation uses energy, it allows houses to be airtight, energy efficient and comfortable and will save a lot of energy overall.

By providing a known amount of air to each room or mechanically mixing all air in the residence, the amount of fresh air that needs to be provided can be lowered to what is really needed, which is in the order of 3 to 15 cfm/person. Depending on the amount of pollutants in the environment, 7.5 cfm /person is a good minimum number if every room gets its own supply. That is the basis of ventilation requirements in standards around the world.

Current minimum code ventilation requirements allow exhaust-only ventilation based on an assumption that the house is not particularly airtight so that a principal exhaust fan will drive a modest amount of air change through the house [assuming the fans are operated]. However, there is no certainty of effective distribution of the fresh air.

Can natural ventilation work? If this means expecting occupants to open windows to allow air in and out, then it won't work. Most people leave their windows closed on cold winter nights and hot humid summer days, but they still need fresh air, and the need is continuous. Some ventilation must be provided without occupant input.

The big challenge for the continuous operation of the fans is the fan noise– (the National Building Code allows 2.5 sones). The BC Building Code allows a continuously operating fan to have a noise level of 1.5 sones but that is still far too loud for many – 1 sone would be a preferable limit. There are a variety of fans meeting that level on the market.

From an energy performance perspective, an HRV will provide heat recovery and reduce energy loss from the building. However, for this to be effective, the house must be airtight and the HRV must be installed properly.

Although the HRV provides energy recovery, perhaps the most important aspect of the HRV is that it will, at the end of the day, be operated continuously. The HRV provides continuous air change, with a minimal amount of energy cost, and the experience across the country is that homeowners perceive a benefit to the heat recovery and will tend to keep it operating, unlike the situation with code minimum exhaust fans, which they perceive as costing energy so will turn them off, even though the air flows are quite small, and heat content of warm air is small, so the real energy cost is modest. If energy prices increase, there will be a more noticeable energy payback with HRVs.

The air change that is needed to maintain fresh air for people is spelled out in CSA F326 (Residential Mechanical Ventilation Standard) which is already referenced in the building code. Ventilation capacity is based on a room count, not house size. A typical 3-bedroom house will need a system with a capacity of about 120-140 cfm, depending on number of rooms in the house. This is different from the air change rate (ACH) that is measured with a blower door to determine how airtight the house is.

We want houses to be airtight in order to deal with basic construction durability and performance issues. But once we start building tight houses, we need to introduce ventilation air. The more airtight the house, the better we can manage ventilation air change. A balanced ventilation system is always desirable. An energy efficient house should have a heat recovery ventilation system because it will reduce the energy load caused by regular exhaust-only ventilation.☼

Energy Answers

Rob Dumont

Has any group come up with a comprehensive theory on how to make the world a sustainable place? More importantly, has this theory been successfully used anywhere in the world?

I am no expert in this area, but it seems to me that the Natural Step Process, initiated in Sweden, has the best overall approach for achieving sustainability.

A good definition of sustainability was developed by the Bruntland Commission: "Sustainable development ... meets the needs of the present without compromising the ability of future generations to meet their own needs." The evidence of a compromised planet is now widespread: rising carbon dioxide, methane, and nitrous oxide levels, rising sea levels, extreme storm damage like that from hurricane Katrina in New Orleans, toxic air pollutants, soil erosion, deforestation, uncontrollable insect infestations (such as the pine beetle decimation of BC's forests), polluted water, species extinction —the list goes on. These are global problems. We are all downwind of our pursuit of increased energy and consumption. At the same time, world population pressure is increasing as is consumption per person.

As one example, the consumption of petroleum in my lifetime of 61 years has increased by a factor of 10. The baby boom generation, of which I am a member, has witnessed and caused the greatest man-made damage to the earth in recorded history.

Here are the four principles of the Natural Step. They are listed in the book *The Natural Step for Communities* by Sarah James and Torbjorn Lahti. Most of the examples used in this column are taken from their excellent book, which is published by New Society Publishers. (*www.newsociety.com*)

In the sustainable society, nature is not subject to systematically increasing:

* *Concentrations of substances extracted from the Earth's crust*
* *Concentrations of substances produced by society*
* *Degradation by physical means*

And, in that society:

* *Human needs are met worldwide.*

These principles, on first reading, sound very abstract and are not a rousing a call to action. Drilling deeper, however, these four principles have much substance.

Let's examine them in further detail:

1. Increasing substances extracted from the Earth's crust.
   These substances include some nasty elements, such as heavy metals, cadmium, lead and mercury. These are elements and cannot be broken down further into less harmful elements by ordinary chemical processes. Fossil fuels are similar in that their eventual combustion results in air pollutants such as carbon dioxide and nitrogen oxides. A sustainable world cannot tolerate ever increasing levels of extraction of these substances.

2. Substances produced by society.
   The US Environmental Protection Agency now lists more than 70,000 chemicals that are in common use. Dioxins and PCBs are just two artificial compounds produced by society. More recently, flame retardant chemicals used in upholstery and household equipment have been found to interfere with brain and thyroid development. According to the EPA, every US citizen's fatty tissue contains at least 700 chemical contaminants. The synergistic effect of multiple chemicals on humans has not been studied to any extent.

3. Human degradation of nature
   Nearly one-half of the earth's original forests have been lost. Two of every three species is estimated to be in decline. Here in Canada the cod fishery in the Atlantic was decimated by overfishing. Human activity is breaking down natural systems faster than these systems can renew themselves. We are poisoning our own wells.

4. Human Needs
   Many people on the planet live in conditions that undermine their capacity to meet their needs.
   More than 1.5 billion people do not have access to electricity. If people around the world cannot meet their basic human needs, the first three Natural Step system conditions will not be met. For instance, when I was working in Nairobi, Kenya in the late 1960s there was a beautiful forest on the north end of the city that helped protect the water supply for the city. That forest has now been completely eliminated as people illegally remove the trees to make charcoal for cooking fuel.
   The control of 80% of the world's weath and resources by 20% of the world's population is not sustainable. Basic human needs—air, water, food, shelter—should take precedence over the provision of luxuries.

The Natural Step Process was developed in 1989 by Dr. Karl-Henrik Robert of Sweden, who summed up a path toward sustainability as follows: "Find fundamental principles of indisputable relevance, and thereafter ask the advice of others on how to apply them."

In Sweden, there are now more than 50 municipalities that have taken up the Natural Step Process. Sweden as a whole has set a goal to be completely petroleum free by 2020.

How will this be done?

Sweden has a head start on sustainable energy because right now it uses roughly half as much energy per capita compared with North America. Sweden's building code requires much higher insulation levels than those on this continent. For instance, as early as the 1980s, super-insulated walls with R40 insulation were mandated along with air tightness and controlled ventilation.

For transportation fuels, biomass-based ethanol and bio-diesel will be used instead of fossil fuels. Public transport systems including buses and trains are being strengthened.

Electricity will be supplied by renewable energy in the form of hydroelectricity and by wind power. In addition, wood waste from sawmills and municipal waste will be incinerated for producing electricity and heat in combined heat and power installations. Heat pumps will be used to improve the efficiency of using electricity for space and water heating. (Denmark already gets about 20% of its annual electricity from wind power, and it is expected the percentage could increase to about 50%.)

The Natural Step Movement has a Canadian chapter and the resort municipality of Whistler, BC was the first community in the world to vote The Natural Step system conditions into their constitution. For more information, have a look at *www.naturalstep.ca.*

Sustainable is possible, and Sweden is pointing the way.

Dealing With Climate Change In Housing

In Canada, we are only beginning to talk about dealing with climate change.

We may have world-class knowledge and the ability to produce environmentally appropriate and energy efficient homes. The R-2000 standard and the Equilibrium homes show how we can raise the bar. Renewed interest in programs such as R-2000, Energy Star homes, and Built-Green is growing again.

In practice, however, with the exception of a small number of builders and designers, we are a long way from putting that knowledge and ability into practice across the board. There is a lot of room for improvement. Tentative steps are being taken by regulators to raise standards, but with much consternation among the industry, and we know that regulations are not the complete solution.

It is interesting to learn what is happening in other countries, where recognition of and dealing with climate change is driving activity.

Archicentre, the building advisory service of the Royal Australian Institute of Architects, said the recent release of a damning United Nations climate change report meant it was time for dramatic action. They have suggested that before a house can be sold, it should be subject to a basic climate change certification that would require a number of appropriate steps to be taken to reduce the building's impact on the environment.

Upgrade costs would be at the vendor's cost, supported by a tax credit. For new homes, they recommend requiring homes to meet new standards of environmental sustainability. A similar policy should be implemented for commercial properties.

For information on an interesting homeowner information resource, check *www.archicentre.com.auwww.archicentre.com.au.* Pity it's only for Australians.

NRC·CNRC

Encouraging Innovation in Construction Products

By John Flack
Manager of the Canadian Construction Materials Centre of NRC-IRC

The NRC Institute for Research in Construction (NRC-IRC) supports innovation in construction not only through research, but also through the product evaluation service it provides through its Canadian Construction Materials Centre (CCMC).

A CCMC evaluation is an impartial, technical opinion on the compliance of the product or system with the objectives, functional statements and minimum level of performance required by the National Building Code (NBC) 2005, or with the requirements of a provincial code. The final decision on the acceptability of the product and its code compliance, however, rests with the regulatory authority involved.

CCMC evaluation officers, when they receive a request to evaluate a novel product, first determine whether the request is within their mandate. Products that are covered by other programs are redirected to the appropriate agency. For requests applicable to CCMC, the initial step is the production of a scope and evaluation plan (SEP). This document outlines the scope of the evaluation, determines the applicable NBC requirements and provides input obtained from the provincial authority having jurisdiction. The next step is to develop a technical guide based on the code analysis in the SEP. The guide is written with technical input from experts from within NRC, academia and elsewhere. CCMC then directs the manufacturer or distributor to a third-party Standards Council of Canada accredited laboratory of their choice to perform the testing specified in the guide.

CCMC evaluation officers analyze the test results and, if the evaluation is positive, CCMC issues its technical opinion on the product's compliance to the NBC in the form of an Evaluation Report. The Evaluation Report also contains other key information, including product description, technical data on which the opinion is based, and any conditions or limitations associated with the evaluation.

Evaluations are undertaken for products manufactured, assembled, or processed at a particular site or manufacturing facility and they apply only to those products. The opinion rendered is limited to the question of the product's compliance to minimum code requirements. The reports do not address consumer issues such as warranties or colour.

CCMC does not rank or compare products, i.e., it does not say product A is better than product B. Furthermore, CCMC does not act as a consumer advocate or watchdog for new products generally.

Evaluation reports can be found on the CCMC Web site in the *Registry of Product Evaluations*. The Web version is the official version of the Registry. It is updated quarterly and can be viewed free of charge at *http://irc.nrc-cnrc.gc.ca/ccmc*.

The 2007 edition of the Registry is also available free of charge on CD-ROM. It can be ordered from the NRC Virtual Store at *www.nrc.gc.ca/virtualstore* or by contacting NRC-IRC Publication Sales at 1-800-672-7990. Print versions are no longer available.

The Registry contains information on more than 500 products, from foundation piles to engineered wood, from air barriers to insulation and doors and windows. Users can search the Registry by manufacturer or product name, MasterFormat number, report number, CCMC reference number, or keyword. In addition, the CCMC Web site has a feature that allows users to contact a manufacturer directly.

Each CCMC evaluation report is assigned a number, which report holders may use on their product, packaging or product documentation to show that the product has been evaluated by CCMC. CCMC has two types of report. Those pertaining to innovative products have the letter R after the report number. In these reports CCMC expresses an opinion on code compliance, as explained above. The other type of report has the letter L after the number and denotes compliance of a product to a recognized standard. Compliance with a standard does not mean compliance with the NBC. Even if a supplier shows that a product has a CCMC number, it does not guarantee that the evaluation for the product is still valid or in effect. Users should check the Registry and make sure the product and it evaluation report are still included. If it is not, it is advisable to contact CCMC and ask about it.

Proponents whose products and systems have been evaluated by CCMC and who wish to obtain evaluations in other countries can obtain technical help from CCMC for this purpose. Being a founding member of World Federation of Technical Assessment Organizations, CCMC can utilize its network of assessment organizations to provide guidance and assistance. ☼

For more information about CCMC, please contact
John Flack: *john.flack@nrc-cnrc.gc.ca*

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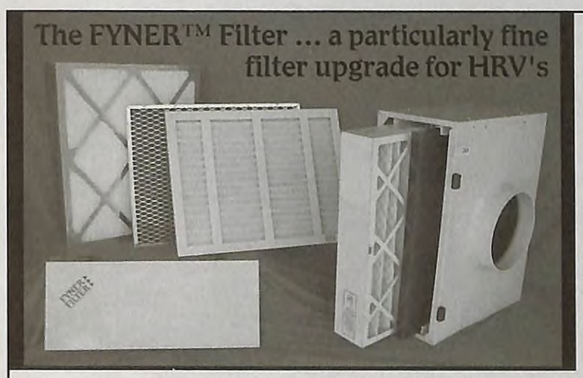

With an HRV, The FYNER™ Filter needs no boost fan and uses little additional energy.

Mounting Options:
- *vertical,*
- *horizontal, or*
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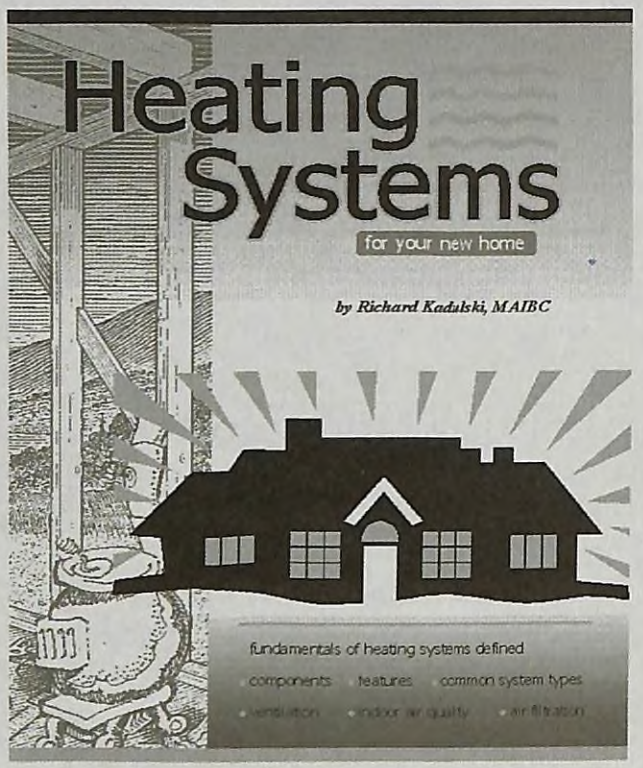

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